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Dated 10 August 2000

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THE PATENT OFFICE C -8 JUL 1999 LONDON

The Patent Office

09JUL99 E460854-3 D02917
P01/7700 0.00 - 9916082.2

Request for grant of a patent

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

08 JUL 1999

1. Your reference
1830001/AM

2. Patent Application Number
9916082.2

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Scientific Generics Limited
Harston Mill
Harston
Cambridgeshire CB2 5NH

Patents ADP number *(if known)* 5698574003

If the applicant is a corporate body, give the country/state of its incorporation — Country: **ENGLAND** State:

4. Title of the invention

EYE SAFE LASER COMMUNICATION SYSTEM

5. Name of agent — **Beresford & Co**

"Address for Service" in the United Kingdom to which all correspondence should be sent

2/5 WarwickCourt
High Holborn
London WC1R 5DJ

Patents ADP number 1826001

6. Priority details

Country	Priority application number	Date of filing

Patents Form 1/77

7. If this application is divided or otherwise derived from an earlier UK application give details

Number of earlier of application | Date of filing

8. Is a statement of inventorship and or right to grant of a patent required in support of this request?

YES

9. Enter the number of sheets for any of the following items you are filing with this form.

Continuation sheets of this form	
Description	**2**
Claim(s)	
Abstract	
Drawing(s)	**1**

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents form 7/77)*	**1 + 2 COPIES**
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for Substantive Examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature Beresford & Co Date 8 July 1999

BERESFORD & Co

12. Name and daytime telephone number of person to contact in the United Kingdom

ALAN MACDOUGALL

Tel:0171-831-2290

Eye Safe Laser Communication System

Background

The applicant has described in WO98/35328 an optical communication system employing a pixellated reflective modulator array combined with a telecentric optical system. The system operates by assigning each user of the system a unique pixel in the array. Each pixel in the array maps to a unique angular position in the field of view of the telecentric optical system (figure 1). The content of WO98/35328 is incorporated herein by way of reference.

The range over which such a system can operate is determined in part by the laser power. In a conventional free space laser communication system, the maximum power which can be transmitted is determined by the requirement to be eye safe. For example, many systems operate at wavelengths of around 850nm. In order for these systems to be fall within class 1, the mean power transmitted must be below 0.5mW, and to fall within class 3a must be below 2.5mW. Some systems operate at the longer wavelength of 1.55μm. Due to the absorption of the aqueous humour of the human eye, higher power levels are possible at this longer wavelength. The class 1 limit at 1.55μm is 10mW, and the class 3a limit is 50mW. The additional power available at 1.55μm is in part negated by the fact that optical receivers at 1.55μm are less sensitive than the Silicon Avalanche Photodiode Receivers available for wavelengths below 1μm.

Our invention allows systems operating at high power to be classified as eye safe.

Description of the Invention

Our invention makes use of the unique properties of the communication system described in WO98/35328. In such a system, the laser source is placed at the receiver end of the link, and operates by using light retro-reflected by the modulator end. Firstly, since the laser is physically located at the receiver end, its output power can be controlled by electronics at the receiver. Secondly, the received signal level gives a reliable indication of the link integrity. Our invention makes use of these two facts.

Systems built according to our invention continuously monitor the signal strength received from the modulator. Consider the situation in which the beam is interrupted by a person. This is potentially a hazardous situation, since the person is now illuminated by the beam part of which may enter the pupil of the person's eye. As noted above. Conventionally this problem is dealt with by ensuring that the laser power level is at safe levels even in this situation. In the case of systems according to WO98/35328, such an interruption of the beam causes an almost instantaneous drop in received signal level. The system can then reduce the laser power to safe levels.

The system can then normally operate at power levels exceeding class 3a, but may be classified as a class 1 system provided that the `single pulse' exposure time for that power level at class 1 is not exceeded.

The system would typically maintain data concerning the recent history of the signal strength. This would allow a slowly reducing signal level (caused for example by deteriorating atmospheric conditions) to be distinguished from a sudden interruption, and the laser turn-down threshold level adjusted accordingly.

By way of example, a system operating at 850nm could be considered class 1 with a laser power of 150mW, provided that in the event of a beam interruption the power is reduced to class 1 level (0.25mW) within 1ms. This would give an increase in power budget over a conventional class 1 system of almost 28dB.

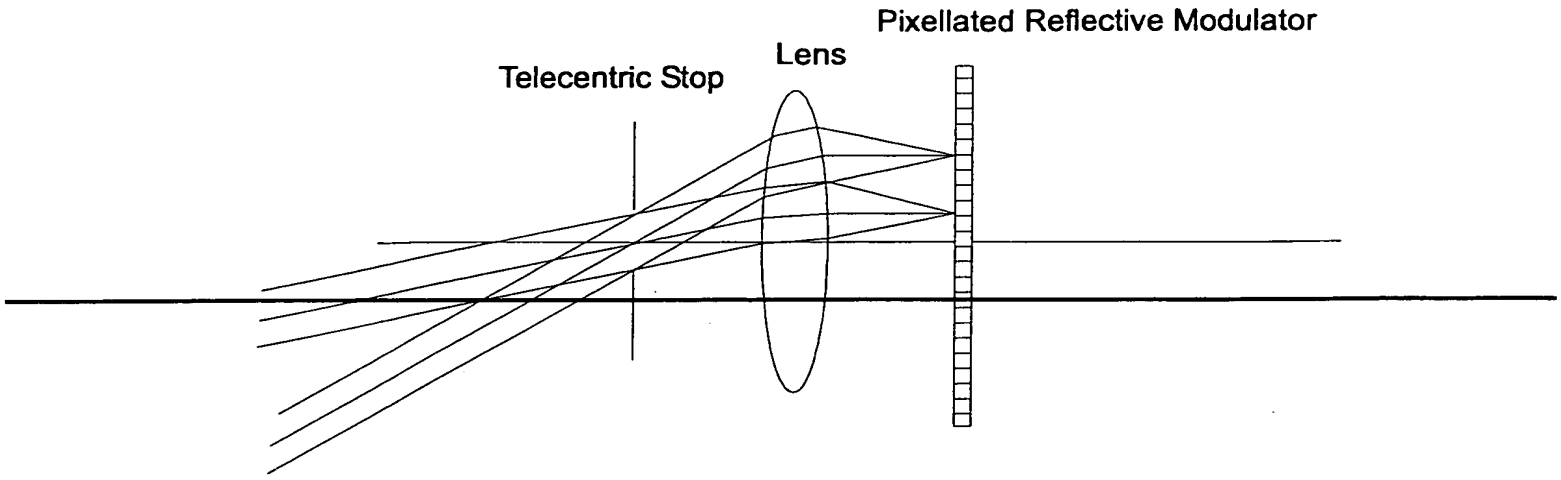

Figure 1